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While a good knowledge of the composition of the normal waters of any region is of the greatest value in the interpretation of an analysis, it is claimed "there is no good basis for the establishment of fixed limits for all the various items of analysis below which a water is to be pronounced good and above which it is to be condemned." The value of an analysis, or the opinion of the analyst, about a certain water which has been examined by him, does not depend upon the fullness of his work alone, but also upon the amount of his knowledge concerning the conditions that surround the water. It is not, however, an easy matter to obtain a good knowledge of its surroundings, and on this account the value of the opinion of the analyst is not of so much value. It is better to take the advice of the analyst according to his experience and reputation, rather than to try and obtain an unbiased opinion by withdrawing facts necessary for a satisfactory judgment.

ATCHISON AND NEMAHA COUNTY MINERAL WATERS.

By E. B. KNERR, Atchison, Kan. Read before the Academy January 2, 1897.

The drift in Atchison county is quite uniform in structure, being a heavy compact clay for the most part, with but little gravel and sand intermixed. Water will pass through it very slowly; hence, the wells dug into it are deep, as a rule, usually from 40 to 60 feet in depth; and the water generally stands quite low, though about three feet of water may generally be counted upon in the driest months. Such wells at those seasons may be easily be pumped dry, but in the course of several hours the water will collect to the depth of a foot or two again. Analysis of this drift water presents nothing of unusual interest.

There are numerous springs in Atchison county. Where these issue from the limestone they are of interest only as furnishing good, cool drinking-water. Several such springs occur within the city limits of Atchison, and have always supplied the neighborhoods in their immediate vicinity with water. One of these springs had for years enjoyed a reputation for medicinal virtues. I was sufficiently interested to make an analysis of its waters, with the following results, which, however, do not reveal, so far as I could discover, any unusual therapeutic qualities (parts per 1,000,000):

NO	Trace
NO ₂	79.0
SiO ₂	30.0
SO ₃	97.0
CO	217.0
Cl.....	58.0
Basic oxygen.....	133.0
Fe.....	6.0
Al	Trace
Ca	156.0
Mg.....	25.0
K	6.0
Na.....	111.0
NH ₄	Trace
P ₂ O ₅	4.0
Total solids.....	922.0

The presence of nitrites, nitrates, phosphates, and chlorides made me suspect that possibly the water was contaminated with surface or sewage waters. This suspicion was confirmed when a day after a heavy rain the flow of water was perceptibly increased.

However, when the springs issue from shale beds they are usually weaker in flow, and the waters leave a stain of iron along their course, and at times show a slight iridescent film on their surface.

When wells are put down about Atchison to a depth of 200 to 300 feet, the water obtained is salty. In the western part of the city, in part of Mr. Peter Becker's property on West Main street, there is such a well 325 feet deep. The water from this well is too salty to drink. When first drawn it is surcharged with carbon dioxide gas, and is perfectly clear. But as the gas escapes the water becomes turbid with a precipitate of iron oxide. The analysis of this water stated in parts per 1,000,000 resulted as follows:

SiO ₂	18.0
SO ₃	924.0
CO ₂	435.7
P ₂ O ₅	18.0
Cl	15530.0
Basic O	415.0
Fe and Al	42.0
Ca	420.0
Mg	310.0
K	36.0
Na	10100.0
NH ₄	20.0
Total solids	28298.7

About 2½ miles north of Centralia, in Nemaha county, is a well 125 feet deep, the water of which is highly charged with sulphate of lime. Whether this argues gypsum deposits at that depth we will not state. The analysis of the water is as follows, stated in parts per 1,000,000:

SiO ₂	25.0
SO ₃	1625.5
CO ₂	634.1
Cl	36.0
Basic O	306.0
Fe	2.8
Al	3.7
Ca	494.0
Mg	156.7
K	25.0
Na	31.5
NH ₄	1.4
NO	4.2
NO ₂	9.9
P ₂ O ₅	46.8
Total solids	3402.6